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ABSTRACT

This study tests the hypothesis that labeling facilitates recall in nursery school children if and only if it leads to rehearsal. Subjects were 34 children ranging in age from 47 to 53 months. During pretraining, those children in the Label group named pictures of animals and fruits as they were presented, while those in the No Label group matched each picture to the same card in a second set of pictures. Eight test trials followed. During each one the child was shown two pictures, one at a time, with exposure ended as soon as he named them (or in the No Label group, after a comparably brief exposure.) For all subjects there was a 20-second delay between presentation and recall, during which the tester conversed with the child to prevent rehearsal. Subjects who labeled showed recall superior to that of subjects who did not, indicating that the facilitating effect of labels in short-term memory is not solely attributable either to an increased tendency to rehearse or to the strengthening of a primary memory source. (Author/NH)

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# RESEARCH BULLETIN

# EFFECT OF LABELS ON MEMORY IN THE ABSENCE OF REHEARSAL

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Educational Testing Service
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# EFFECT OF LABELS ON MEMORY IN THE ABSENCE OF REHEARSAL[1]

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Children who possess and use distinctive labels for the stimuli generally perform better in short-term memory tasks than do children who do not possess labels or who have but do not use them (Kingsley & Hagen, 1969). Subjects below the second or third grade level often are able to name stimuli on request, yet fail to use these names in tasks where older children both name and rehearse (Flavell, Beach, & Chinsky, 1966); their performance may be improved by inducing rehearsal (Keeney, Cannizzo, & Flavell, 1967; Kingsley & Hagen, 1969).

Requiring the child to label overtly without prompting him to rehearse also appears to facilitate memory in grade school children except when, at older ages, it interferes with covert verbalization and rehearsal in which he would have engaged spontaneously (Hagen & Kingsley, 1968). With nursery school children, however, it is not clear whether labeling alone is effective. Bernbach (1967) found his labeling group to be superior to those not given labels and suggested that labeling has its effect by promoting rehearsal. Hagen and Kingsley (1968) and Kingsley and Hagen (1969) found no overall effects of labeling versus nonlabeling; however, the latter study presented evidence that the labeling group did not rehearse. Both these studies provided suggestive evidence that on those items presented just before the recall test, overt labeling may improve recall; they attributed this effect to facilitation of "a very short-term memory trace" rather than to rehearsal. However, neither study was able to show the significant interaction between labeling and serial position which would fully justify their conclusion.

Thus, it remains possible that labeling facilitates recall in nursery school children if and only if it leads to rehearsal.

The present study provided a test of this hypothesis. During pretraining one group practiced labeling the stimuli while another, in effect, practiced observing without labeling. On each trial in the memory task subjects were shown pictures only long enough to name them; a 20-second delay period followed during which the tester engaged the child in conversation to prevent rehearsal. Subjects then had to pick from an array of 10 pictures the two that had been presented. If subjects who labeled were to make fewer errors than those who did not, it would show that rehearsal is not necessary for labeling to improve memory in nursery school subjects. Moreover, a 20-second period of interference should be sufficient to allow decay of the short-term memory trace posited by Kingsley and Hagen (1969). This trace appears to be similar to retention in "primary memory" (Waugh & Norman, 1965)--a short-term storage, severely limited in the number of items that can be retained, and from which items can enter "secondary" memory if they are rehearsed. If so, it should show more than 90% decay after a dozen interfering items (for example, words) have intervened between presentation and recall (Waugh & Norman, 1965, Fig. 9). Thus, positive results would also suggest that some process in addition to that proposed by Kingsley and Hagen (1969) contributes to the labeling effect.

## Method

Subjects. Subjects were 34 children attending a laboratory nursery school. They ranged in age from 47 to 53 months at the time of testing ($M = 50.7$, $S.D. = 1.8$). No IQ data are available, but a slightly older

group from this school tested in another study showed a mean Peabody Picture Vocabulary Test IQ of 115.

Materials. The stimuli were pictures of five common animals (dog, cat, elephant, monkey, bear) and five fruits (apple, orange, banana, pear, and grapes) drawn in color on 3 x 4 white cards. There were few errors in naming these, so it may be assumed that the names were familiar ones.

For the recall test a duplicate set of pictures was arranged in a 2 x 5 array on a white styrofoam tray. Below the niche for each picture a space large enough to contain a marble was hollowed out. Between tests a cloth over the tray hid the array from the child.

Procedure. Subjects were first shown the set of 10 pictures. Those in the Label group named each picture as it was presented, while those in the No Label group matched each picture to the identical card in a second set of pictures. Each picture was shown twice, and any card on which the child made an error was presented again at the end of the series. If a subject in the No Label group named the picture, he was told "You don't have to say anything; just look at the picture."

Next, subjects were familiarized with the recall procedure. After the procedure was explained, the child received two practice trials, first attempting to identify a picture he had just been shown, and then experiencing a 20-second delay before he was shown the array in which to search.

Eight test trials followed. On each trial the child was shown two pictures, one at a time, with exposure terminated as soon as he named them (or in the No Label group, after a comparably brief exposure). The tester watched the child's eyes to be certain that he did look at each picture before it was removed. She chatted with the child for 20 seconds, encouraging

him to talk by asking questions like: "Do you have any brothers and sisters?" or "Have you ever seen an alligator?", and continuing herself to talk if the child did not respond. Conversation concerning the task or the stimulus pictures was avoided. Unsystematic observation led to the conclusion that the tester was successful both in filling the interval with verbiage, and in terminating the conversation smoothly when it was time to test for recall. The array of pictures was then uncovered and the child indicated which two had been exposed previously. He collected marbles for his correct choices and waited while the tester rearranged the array and hid the marbles for the next trial.

Seventeen different stimulus orders were used, each with one child in each group. The orders were random with the restrictions that each picture was a "target" stimulus at least once and not more than twice on test and familiarization trials, that no picture was a target stimulus on two trials in succession, and that on exactly half the trials both targets were members of the same category (both animals or both fruits). The pictures in the array were arranged in a different random order on each practice and test trial, with one such set of randomizations used for approximately half the subjects, tested at the end of the school year, and a second set of randomizations used for the remaining subjects, tested the following fall.

## Results

Each child was given a score for total number of errors over the eight test trials. The 18 males and 16 females tested did not differ on total number of errors ($U = 101$, $p > .10$)[2] nor did the 18 subjects tested in the spring differ from the 16 tested in the fall ($U = 110$, $p > .10$). Hence, these subgroups were combined for data analysis.

The main results are shown in Table 1. Subjects who labeled the

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Insert Table 1 about here

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stimuli as they were presented made an average of 3.00 errors, while those who did not label averaged 5.18 errors; this difference is highly significant (by Mann-Whitney U-test, $U = 52$, $p < .002$).

If a recency effect like that proposed by Kingsley and Hagen (1969) were operative in these data, despite the period of interference between stimulus presentation and recall, the facilitating effect of labeling might be confined to the second "target" stimulus presented on each trial. However, labeling led to fewer errors both on target stimuli presented first on test trials ($M = 1.82$ vs. $2.82$, $U = 73$, $p < .02$) and on those presented second ($M = 1.18$ vs. $2.36$, $U = 58$, $p < .02$). Neither group showed a significant recency effect. In addition, when the order in which the child chose stimuli from the array is considered, subjects who labeled made fewer errors on both their first choices ($M = 0.59$ vs. $2.00$, $U = 38$, $p < .002$) and their second choices ($M = 2.41$ vs. $3.18$, $U = 77$, $p < .02$).

## Discussion

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The authors are aware of six processes that have been offered to explain facilitating effects of labels. First, naming may orient the child to the stimulus, assuring that he is exposed to the information available (Weir & Stevenson, 1959). Second, it may facilitate rehearsal (Bernbach, 1967). Third, naming may reinforce a short-term memory trace (Kingsley & Hagen, 1969), increasing the probability or duration of storage in "primary" memory (Waugh & Norman, 1965). Fourth, according to the "acquired distinctiveness

of cues" hypothesis, labeling may render stimuli "functionally more dissimilar" and thus easier to discriminate (Spiker, 1956). Fifth, it may direct the child's "observing responses" (Kurtz, 1955), possibly causing him to search for aspects or dimensions of the stimulus which will be especially useful in discriminating it from other stimuli. Finally, naming may increase the "availability" of a category (Brown & Lenneberg, 1954); perhaps, then, if the subject is not sure which stimulus he has been shown, his guessing will be directed by the relative availability of the names of the response alternatives.

Most of these possibilities are poorly specified, and they are not mutually exclusive. Spiker has suggested, for example, that facilitation of performance in the acquired distinctiveness of cues experiments might be attributable to differential rehearsal (Spiker, 1963); rehearsal might itself be interpreted as repeated reinforcement of the short-term trace proposed by Kingsley and Hagen (1969). Insofar as these processes are independent, however, only two of them may be discounted as explanations for the present results--it appears unlikely that subjects could have rehearsed the stimuli, or that they could have maintained a short-term trace activated by labeling over the period of interference between stimulus presentation and recall. Both experimental ingenuity and further theoretical specification will be required to determine which among all these alternatives provide a sufficient set of processes to explain fully the effects of labeling in nursery school children.

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## Footnotes

[1]This research was completed while the authors were at Stanford University. Appreciation is owed to Drs. Gordon Hale and Phillip Kingsley for critical reviews of the manuscript.

[2]All probability levels reported are for two-tailed tests.

Table 1

Number of Errors in Recall

| Group | N | Mean | S.D. | Median |
|---|---|---|---|---|
| Label | 17 | 3.00 | 2.67 | 2.3 |
| No Label | 17 | 5.18 | 3.52 | 4.9 |